

What is claimed is:

- 1 1. A system for bracketing a tissue volume comprising:
 - 2 a. a plurality of markers, each marker in said plurality having a maximum
 - 3 dimension of no more than 5mm, as measured along any axis extending
 - 4 through said each marker;
 - 5 b. a probe; and
 - 6 c. a detector connected to said probe that provides information when said probe
 - 7 is moved proximate to one of said plurality of markers.
- 1 2. A system according to claim 1, wherein said maximum dimension is no more than
- 2 2mm.
- 1 3. A system according to claim 1, wherein said detector further includes at least one
- 2 selected from the group consisting of a sound source, a light source, a source of
- 3 pressurized air, a display for providing changing proximity information, a dial with a
- 4 movable needle, and a display for displaying an image.
- 1 4. A system according to claim 3, wherein said information is at least one of sound,
- 2 light, pressurized air, visually represented proximity information, movement of a
- 3 needle, and an image on a display that is provided, respectively, by said sound source,
- 4 said light source, said source of pressurized air, said display for providing changing
- 5 proximity information, said dial and said display for displaying an image.
- 1 5. A system according to claim 1, wherein said detector provides said information so
- 2 that an attribute thereof varies as a function of proximity of said probe to individual
- 3 markers in said plurality of markers.
- 1 6. A system according to claim 1, wherein at least one of said plurality of markers emits
- 2 gamma rays.

1 7. A system according to claim 1, wherein at least one of said plurality of markers
2 generates a magnetic field.

1 8. A system according to claim 1, wherein at least one of said plurality of markers
2 generates a radio frequency signal.

1 9. A system according to claim 1, wherein at least one of said plurality of markers
2 includes:

- 3 a. an antenna; and
- 4 b. a radio frequency generator connected to said antenna for generating a first
5 radio frequency signal having a first frequency for transmission by said
6 antenna.

1 10. A system according to claim 9, further including a circuit connected to said antenna
2 for detecting and regulating an exciter signal received by said antenna, wherein said
3 radio frequency generator is designed to generate said first radio frequency signal
4 using energy in said exciter signal.

1 11. A system according to claim 10, further including an exciter for generating said
2 exciter signal.

1 12. A system according to claim 1, wherein each of said plurality of markers includes:

- 2 a. an antenna;
- 3 b. a circuit connected to said antenna for generating a radio frequency signal, in
4 response to receipt of an exciter signal, having a frequency that is different
5 from frequencies of said radio frequency signals generated by other ones of
6 said plurality of markers; and
- 7 c. an exciter for generating said exciter signal, wherein said exciter signal does
8 not include a radio frequency signal having a frequency that is the same as
9 frequencies of said radio frequency signals generated by said plurality of
10 markers.

1 13. A system according to claim 1, wherein at least one of said plurality of markers
2 vibrates.

1 14. A system according to claim 1, wherein at least one of said plurality of markers
2 includes:

- 3 a. a piezo-electric device that oscillates mechanically in response to an
4 oscillating electrical signal; and
5 b. a circuit connected to said piezo-electric device that generates said oscillating
6 electrical signal.

1 15. A system according to claim 14, wherein said at least one of said plurality of markers
2 has a housing that is designed to resonate at a first frequency and said piezo-electric
3 device is coupled to said housing so that mechanical oscillations of said piezo-electric
4 device are transmitted from said piezo-electric device to said housing.

1 16. A system according to claim 14, wherein said at least one of said plurality of markers
2 includes:
3 a. an antenna for receiving an exciter signal;
4 b. wherein said circuit is connected to said antenna and is designed to generate
5 said oscillating electrical signal when said antenna receives said exciter signal;
6 and
7 c. an exciter for generating said exciter signal.

1 17. A system according to claim 1, wherein at least one of said plurality of markers
2 includes a plurality of plates that are configured, positioned and made from a material
3 such that said at least one marker strongly reflects ultrasound energy incident thereon.

1 18. A system according to claim 1, wherein at least one of said plurality of markers is
2 designed to reflect ultrasound energy incident thereon.

- 1 19. A system according to claim 1, wherein at least one of said plurality of markers
2 includes a capsule filled with a colored dye.
- 1 20. A system for bracketing a tissue mass comprising:
2 a. a plurality of markers, each having a detection characteristic;
3 b. a probe; and
4 c. a detector that detects said detection characteristic and provides a humanly
5 recognizable representation of proximity of said probe to one of said plurality
6 of markers that varies as a function of changes in said proximity.
- 1 21. A system according to claim 20, wherein said detection characteristic is gamma rays.
- 1 22. A system according to claim 20, wherein said detection characteristic is a magnetic
2 field.
- 1 23. A system according to claim 20, wherein said detection characteristic is radio
2 frequency electromagnetic energy.
- 1 24. A system according to claim 20, wherein said detection characteristic is imagability
2 by ultrasound energy.
- 1 25. A system according to claim 20, wherein said detector includes a sensor that
2 determines the strength of said detection characteristic and generates an output signal
3 having a magnitude that varies as a function of the strength of said detection
4 characteristic, as determined at said probe.
- 1 26. A surgical marker comprising:
2 a. a quantity of colored dye;
3 b. a capsule encasing said quantity of colored dye; and
4 c. wherein at least one of said dye and capsule is imagable by at least one of
5 ultrasonic, magnetic resonance and X-ray energy.

1 27. A surgical marker according to claim 26, wherein said capsule has a maximum
2 dimension of no more than 5mm, as measured along any axis extending through said
3 capsule.

1 28. A cutting tool comprising:

2 a. a first portion including:

3 i. a first blade having a first edge with a first curved configuration;

4 ii. a first connector;

5 b. a second portion including:

6 i. a second blade having a second edge, wherein said second edge has a
7 second curved configuration that is designed so that when said second
8 blade is positioned in operative engagement with said first blade, said
9 first edge and said second edge form a substantially continuous cutting
10 edge;

11 ii. a second connector positioned and designed to releasably engage said
12 first connector so as to releasably secure said second blade in said
13 operative engagement with said first blade.

1 29. A cutting tool according to claim 28, wherein said first curved configuration and said
2 second curved configuration are selected so that said substantially continuous cutting
3 edge is circular.

1 30. A cutting tool according to claim 28, further wherein said first portion has a first
2 handle and said second portion has a second handle.

1 31. A cutting tool according to claim 30, wherein said first connector is attached to said
2 first handle and said second connector is attached to said second handle.

1 32. A tissue anchor comprising:
2 a. an elongate tube having a central bore, a distal end and a proximal end,
3 wherein said tube has at least one aperture adjacent said distal end;
4 b. an elongate member having a portion sized for receipt and axial movement in
5 said central bore between a first position and a second position, wherein said
6 elongate member includes a longitudinal axis and at least one anchor member
7 attached to said portion; and
8 c. wherein said at least one anchor member is configured and positioned so that
9 when said portion is in said first position said at least one anchor member is at
10 least partially received in said elongate tube and when said portion is in said
11 second position said at least one anchor member projects through said at least
12 one aperture and extends transversely relative to said longitudinal axis.

1 33. A tissue anchor according to claim 32, further wherein said elongate tube has an
2 outside diameter ranging 0.5mm to 12mm.

1 34. A tissue anchor according to claim 32, wherein said outside diameter ranges from
2 .1mm to 3mm.

1 35. A tissue anchor according to claim 32, wherein said at least one anchor member
2 includes four anchor members.
3

4 36. A tissue anchor according to claim 32, wherein said at least one anchor member has a
5 curved configuration when said portion is in said second position.

1 37. A system for bracketing, stabilizing and removing a tissue volume comprising:
2 a. a marker system including:
3 i. a plurality of markers, each marker in said plurality having a maximum
4 dimension of no more than 5mm, as measured along any axis
5 extending through said each marker;
6 ii. a probe; and

- 7 iii. a detector connected to said probe that provides information when said
8 probe is moved proximate to one of said plurality of markers;
9 b. a cutter including:
10 i. a first portion having:
11 (1) a first blade having a first edge with a first curved
12 configuration;
13 (2) a first connector;
14 ii. a second portion having:
15 (1) a second blade having a second edge, wherein said second edge
16 has a second curved configuration that is designed so that
17 when said second blade is positioned in operative engagement
18 with said first blade, said first edge and said second edge form a
19 substantially continuous cutting edge;
20 (2) a second connector positioned and designed to releasably
21 engage said first connector to releasably secure said second
22 blade in said operative engagement with said first blade; and
23 c. a tissue anchor including:
24 i. an elongate tube having a central bore, a distal end and a proximal end,
25 wherein said tube has at least one aperture adjacent said distal end;
26 ii. an elongate member having a portion sized for receipt and axial
27 movement in said central bore between a first position and a second
28 position, wherein said elongate member includes a longitudinal axis
29 and at least one anchor member attached to said portion; and
30 iii. wherein said at least one anchor member is configured and positioned
31 so that when said portion is in said first position said at least one
32 anchor member is at least partially received in said elongate tube and
33 when said portion is in said second position said at least one anchor
34 member projects through said at least one aperture and extends
35 transversely relative to said longitudinal axis.

1 38. A method of removing a tissue volume from a tissue portion using a plurality of

- 2 markers, the method comprising the steps:
- 3 a. positioning a plurality of markers so as to define a boundary of the tissue
- 4 volume;
- 5 b. detecting the location of a first one of the plurality of markers; and
- 6 c. incising portions of the tissue portion adjacent said first one of the plurality of
- 7 markers substantially along said boundary adjacent said location.

1 39. A method according to claim 38, wherein said positioning step is performed so that

2 said plurality of markers define said boundary in three dimensions.

1 40. A method according to claim 38, wherein said positioning step is performed so that

2 said plurality of markers define said boundary in two dimensions.

1 41. A method according to claim 38, wherein said positioning step is performed so that

2 said plurality of markers define said boundary in one dimension.

1 42. A method according to claim 38, wherein said positioning step involves positioning

2 the plurality of markers using ultrasound imaging to guide placement of the plurality

3 of markers.

1 43. A method according to claim 38, wherein said positioning step involves positioning

2 the plurality of markers using X-ray imaging to guide placement of the plurality of

3 markers.

1 44. A method according to claim 38, wherein said positioning step involves positioning

2 the plurality of markers using magnetic resonance imaging to guide placement of the

3 plurality of markers.

1 45. A method according to claim 38, wherein said positioning step involves positioning

2 the plurality of markers using CAT-scan imaging to guide placement of the plurality

3 of markers.

- 1 46. A method according to claim 38, wherein the plurality of markers includes three pairs
2 of markers, further wherein said positioning step involves positioning the three pairs
3 of markers so that markers of each pair lie on said boundary in mutually spaced
4 relation substantially on opposite sides of the tissue volume.
- 1 47. A method according to claim 38, wherein said positioning step involves positioning
2 said plurality of markers so that at least two of said plurality of markers lie on an X
3 axis and at least two of said plurality of markers lie on a Y axis, wherein said X axis
4 and said Y axis intersect said tissue volume and extend in non-coaxial relation.
- 1 48. A method according to claim 38, further including the steps of repeating said
2 detecting step and said incising step with respect to other ones of the plurality of
3 markers.
- 1 49. A method according to claim 38, further including the steps of repeating said
2 detecting step and said incising step with respect to all of said plurality of markers
3 until the tissue volume is separated from the tissue portion.
- 1 50. A method according to claim 38, further comprising the step, before said positioning
2 step, of identifying a tissue mass located in the tissue volume.
- 1 51. A method of removing a tissue volume comprising the steps:
2 a. forming an incision in skin covering the tissue volume;
3 b. providing a cutter having a first portion and a second portion, wherein said
4 first portion and said second portion are designed to be attached together in
5 operative engagement, said cutter having a cutting edge for cutting the tissue
6 volume;
7 c. inserting said first portion through said incision;
8 d. inserting said second portion through said incision and attaching said first
9 portion to said second portion so as to create said operative engagement; and

10 e. applying a rotational force and a downward force toward the tissue volume to
11 said cutter so as to cause said cutting edge to cut the tissue volume.

1 52. A method according to claim 51, further comprising the step, prior to said step b, of
2 positioning a plurality of markers so as to define a boundary of the tissue volume and
3 the step, after said step d and before said step e, of identifying said boundary by
4 detecting the position of said plurality of markers and then positioning said cutter in
5 alignment with said boundary.

1 53. A method of bracketing a tissue mass in a piece of tissue using a plurality of markers,
2 the method comprising the steps:
3 a. generating an image of the tissue mass; and
4 b. referring to said image of the tissue mass, positioning the plurality of markers
5 in the piece of tissue so as to define a boundary of a tissue volume that
6 includes the tissue mass.

1 54. A method according to claim 53, further comprises the step after said step a and
2 before said step b of positioning the plurality of markers proximate the tissue mass
3 and generating an image of the plurality of markers, further wherein said step b
4 involves referring to said image of the plurality of markers in connection with said
5 positioning.

1 55. A method according to claim 53, wherein said step b involves positioning the plurality
2 of markers so that two of said plurality of markers are positioned on an X axis, two of
3 said plurality of markers are positioned on a Y axis and two of said plurality of
4 markers are positioned on a Z axes, said X, Y and Z axes intersecting the tissue
5 volume and extending in non-coplanar relation.

1 56. A method according to claim 53, wherein said step b involves positioning the plurality
2 of markers so that said X, Y and Z axes are substantially mutual orthogonal.

- 1 57. A method according to claim 53, wherein said step b is performed so that the plurality
2 of markers defines said boundary in one dimension.
- 1 58. A method according to claim 53, wherein said step b is performed so that the plurality
2 of markers defines said boundary in two dimensions.
- 1 59. A method according to claim 53, wherein said step b is performed so that the plurality
2 of markers defines said boundary in three dimensions.
- 1 60. A method according to claim 53, wherein said step b is performed so that said at least
2 two of the plurality of markers are positioned on an X_1 axis and at least two of the
3 plurality of markers are positioned on a Y_1 axis, wherein said X_1 axis and said Y_1 axis
4 are offset along said Z axis, respectively, from said X axis and said Y axis.
- 1 61. A method of removing a tissue mass and surrounding tissue volume from a piece of
2 tissue, the method comprising the steps:
3 a. positioning a plurality of markers in the piece of tissue so as to define a
4 boundary of the tissue volume;
5 b. identifying said boundary by detecting the position of said plurality of
6 markers;
7 c. incising portions of said tissue volume adjacent said plurality of markers
8 substantially along said boundary based on said position of said plurality of
9 markers; and
10 d. stabilizing the tissue volume during said incising step.
- 1 62. A method according to claim 61, wherein said identifying step and said incising step
2 are repeated until said tissue volume is removed from the piece of tissue.
- 1 63. A method according to claim 61, wherein said incising step is performed so that said
2 incising extends in a second direction that is different than said first direction.

- 1 64. A method according to claim 61, wherein said stabilizing step involves pulling the
2 tissue volume in a first direction.

ADD LS-97

add Bu

47